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ABSTRACT

Eighty three applicants for employment in a hardware supply manufacturing company participated in a study of the effects of anxiety, praise and the awareness of time remaining on employment testing. Two control groups and three testing groups--praise, time, and praise and time--were administered the General Aptitude Test Battery (GATB), a two-hour, paper-and-pencil test which measures nine aptitudes: intelligence; verbal, numerical, and spatial aptitude; form and clerical perception; finger and manual dexterity; and motor coordination. The Taylor Manifest Anxiety Scale, a 50-item true--false test adapted from the Minnesota Multiphasic Personality Inventory, was also administered. Applicants were told that the anxiety scale would not effect their chances for employment. The test administrator in the praise group gave words of encouragement before and after subtests. The time remaining until completion of each subtest was announced every 60 seconds in the time group. Encouragement and announcements were combined in the praise and time group. Applicants who were praised and given the time scored significantly higher than those who were not. The subjects' anxiety level did not significantly affect test scores, suggesting that the situation was not perceived as threatening. Descriptions of the GATB and a copy of the Taylor Manifest Anxiety Scale are appended. (Author/JAG)

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EFFECTS OF ANXIETY, PRAISE AND AWARENESS OF TIME IN EMPLOYMENT TESTING

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Introduction

Over the past half century, there has been an accumulation of experience with the use of tests as devices for assessing persons in schools and in business and industry (Ghiselli, 1973). During the past decade, much controversy has raged concerning the use and misuse of employment tests for selection in industry. Less attention has been paid to the actual administration of tests and other non-test factors in employment testing. Tests used in employment situations generally have standardized administration instructions and procedures. However, more effort must be spent to maximize optimal testing conditions for the job applicant, especially in the case of minority job applicant.

Test anxiety, reinforcement, and more recently, conceptual tempo have been investigated as factors influencing test performance. Hambleton and Traub (1974) reported that test anxiety was negatively related to test performance, especially in the area of aptitude tests. A two-way interaction was found by Hill (1973) involving test anxiety and reinforcement conditions. Low test anxious subjects performed significantly better in the criticism conditions than did the high test anxious subjects. In the praise and neutral conditions the performance of high and low anxious subjects was more nearly alike. The level of performance was considerably higher for all subjects in the praise condition. Bush and Dweck (1975) reported that a person's conceptual tempo or response set for operating fast or slow on a test has a significant effect on their test performance.

This study investigated examinee anxiety level and two test administration techniques, praising the examinees and making the examinees aware of the time remaining in the test, in an attempt to determine whether these factors have a significant effect on the test scores of examinees.

Subjects in this study were eighty-three persons who responded to an advertisement for various apprenticeship job openings in a large hardware supply manufacturing company. An experienced test administrator was responsible for the testing, assisted by two proctors from the Michigan Employment Security Commission branch office. Approximately 95% of the applicants scheduled for testing took the tests. The examinees were not informed that a research study was being conducted. The majority of the subjects were white males in their twenties, two or three females and three or four minorities (Blacks) were observed. The experiment called for four groups; a control group and three different experimental groups. The subjects were randomly assigned to the control, praise, time and praise and time groups.

The measuring instruments used were the United States Employment Service General Aptitude Test Battery, B-1002, Form A. The GATB is a two-hour multi-factor instrument consisting of eight paper and pencil tests and four apparatus tests which measure nine aptitudes: General Learning Ability (G), Verbal Aptitude (V), numerical Aptitude (N), Spatial Aptitude (S), Form Perception (P), Clerical Perception (Q), Motor Coordination (K), Finger Dexterity (F), and Manual Dexterity (M). A second instrument used in the experiment was the Taylor Manifest Anxiety Scale. The examinees were told that this

was an untimed biographical inventory under development and was totally unrelated to their chances of obtaining employment.

The following statistical hypotheses were tested: 1) Test scores will not be significantly different under the praise vs control conditions, 2) Test scores will not be significantly different under the praise and time treatment vs just the praise treatment, 3) Test scores will not be significantly different under the time vs control treatment conditions, 4) Test scores will not be significantly different under the time and praise treatment conditions vs just the time treatment, and 5) Test scores will not be significantly different for the various levels of measured anxiety among the subjects.

Data consists of the sum of the aptitude scores per sample member which was the criterion, and the independent variables were anxiety scores, the praise treatment, the time treatment, and the praise and time treatment. These hypotheses were tested by using the multiple regression procedure because it combines the features of being a powerful statistical tool and is suitable for analyzing continuous and categorical variables simultaneously. Seven models were developed so that F ratios could be calculated. An alpha level of .05 was used.

An inspection of the mean scores on the variables revealed that this was a rather typical group of subjects. The anxiety mean score (10.9) was slightly below average for the Taylor Manifest Anxiety Scale while the mean aptitude score of 108.7 on the GATB was considered slightly above average for a sample of high school graduates.

As expected, Model 1 which included all treatments and interactions had the highest R squared value. However, Model 1 was not significantly better than Model 2 which included all treatments but not the interaction. Therefore, the effects of interaction did not add significantly to the predictability of the subject's test scores.

The results showed that four of the five statistical hypotheses were rejected; 1) The statistical hypothesis was rejected. An investigation of the weights in Model 4 showed that the praise treatment having a positive weight (32) while the traditional non-praise treatment has a weight of zero (0.0). In this sample subjects who are moderately praised for their efforts on the test scored significantly higher than persons who received no praise. 2) The statistical hypothesis was rejected. The weights in the Full Model (Model 3) supported the directionality of the research hypothesis. In other words, the praise treatment worked over and above the effects of the time treatment. 3) The statistical hypothesis was rejected. Subjects in the study who were made aware of the time remaining in the test scored significantly higher than persons who were not given this information. 4) The statistical hypothesis was rejected. The time treatment worked over and above the effects of the praise treatment. 5) The statistical hypothesis could not be rejected. Knowledge of the anxiety score did not increase the predictability of test performance on the GATB.

In summary, evidence seemed to indicate that praise and making an examinee aware of the time remaining in a test increased test scores. These two treatments together explained .10 of the variance on the criterion measure. This R squared value is considered fairly

high when one takes into account that most of the variance could be explained by factors such as previous experience, level of education, pretest aptitude scores, and other genetic and environmental factors. However, the subjects anxiety level did not have a significant effect on their test scores. This is consistent with previous research which showed that when instructions were nonthreatening anxiety level had no significant effect on test scores.

The educational significance of this research study lies in the fact that the effects of praise, awareness of time and anxiety on aptitude test scores were investigated all at once. Previous studies on praise generally concluded that test scores were higher when an examinee was praised. No research could be found in the literature which directly examined whether examinees scored higher when they were made aware of how much time remained at various points during a test. The research literature on anxiety was in general agreement that high anxiety subjects scored lower on tests when the instructions were threatening but when the test instructions were not threatening anxiety level had no significant impact on test scores.

Methods & Procedures

This study investigated examinee anxiety level and two test administration techniques, praising the examinees and making the examinees aware of the time remaining in an attempt to determine whether these factors have a significant effect on the test scores of examinees.

Sample members were persons in a metropolitan area who responded to an advertisement for various apprenticeship job openings in a large hardware supply manufacturing company. An experienced MESC test administrator was responsible for the administration of the GATB. Announcements of these openings were made through the company union, the MESC, and the local press several weeks prior to testing. Applicants were told to apply for these openings at the MESC office within two weeks. At the close of the application period, one week prior to testing, eighty-eight persons had applied for the positions. These eighty-eight persons were randomly assigned, based on a table of random numbers to one of five testing groups. Notifications were mailed to the applicants to report to the company for testing at a specified time and date. The subjects were not aware of the research project.

A large conference room was used for all of the testing sessions. The room had satisfactory lighting, ventilation, sound proofing, and size. Restrooms, water fountains, and vending machines were a short distance from the testing room.

The experiment called for four groups; a control group and three different experimental groups. Since the experiment called

for four groups but five groups were available, it was decided to repeat one of the conditions. A randomization method was employed to determine which condition would be repeated. Consequently the control group condition was given to two groups. An additional procedure was devised to determine the order of these five groups. The actual order of conditions were as follows: 1) Praise, 2) Time, 3) Praise and Time, 4) Control, 5) Control.

The Control condition adhered to the standardized administration procedures of the GATB, B-1002 Manual. In the Praise condition, the test administrator or proctor said words of praise and encouragement to the examinees during the practice exercise preceeding each subtest. Examinees were praised once before each test. The praise and the words used varied depending upon the judgment of the person giving the praise. The following words or phrases were used as praise:

OK, looking good
Excellent
Very good
You've got it
Great
You're catching on fast
You're getting everything right, very good

Praise was also given to the entire group after a subtest was completed. The following phrases were used as praise:

You people really went fast, keep it up
You seemed to do very well on that part
Looking good
Very good, you're getting a lot done
Excellent, keep it up

A strong effort was made to work these phrases in naturally, so as not to appear too artificial and contrived. No remarks were made by the examinees regarding the praise statements.

For Time treatment, at the end of the standardized test instructions, the following statement was added:

> "Since you will be taking a series of relatively short speed tests, I will announce the time remaining each minute during the test."

For each of the first seven subtests the time remaining in the test was announced each minute, for example, with four minutes remaining the test administrator would say, "Four minutes left." The test administrator positioned himself in the center of the cluster of tables so that these announcements could be given at a relatively low volume and still be heard. No complaints were received regarding the distracting effect of these announcements.

The Time and Praise treatment consisted of combing the time condition and praise condition described above.

The test administrator in this study was a white male, 37 years of age, who was thoroughly familiar with the administration procedures of the GATB and the special procedures called for by the experiement. Two experienced test administrators from the MESC Branch Office served as proctors during the testing sessions. Both proctors were white females, of approximately 35 years of age. Scoring was done by the proctors and completely double-checked by the administrator.

The aptitude test administered in this study was the United States Employment Service GATB, B-1002, Form A. The General Aptitude Test Battery, in use since 1945, is a two-hour multi-factor instrument consisting of eight paper and pencil tests and four apparatus tests which measure nine aptitudes: General Learning

Ability (G), Verbal Aptitude (V), Numerical Aptitude (N), Spatial Aptitude (S), For Perception (P), Clerical Perception (Q), Motor Coordination (K), Finger Dexterity (F), and Manual Dexterity (M), (Appendix I).

Only the first six aptitudes (G, V, N, S, P, Q) were used in the analysis since the coordination and dexterity tests were too short for the time treatment to have an impact.

The GATB norms were derived from a sample of the general working population, aged eighteen to fifty-four, excluding farm workers, foremen, managers, and service workers. Raw scores on the twelve GATB subtests were converted to standard scores with a mean of 100 and standard deviation of 20.

The battery was developed to measure the ability of the general working population to learn various jobs. It is used by employment and school counselors to assist prospective job applicants to select careers and training programs in which they have a reasonable chance of success.

The state employment services, under the direction of the United States Employment Service have established norms for several hundred different occupations by means of validation studies conducted in cooperation with employers, colleges, and vocational training schools throughout the country.

The typical aptitude-criterion concurrent validity coefficient obtained is .18 whereas the typical predictive validity coefficient is .23. GATB reliability studies have been conducted on samples consisting of Employment Service applicants, high school and college

students, and prison inmates. The tests were administered under standard conditions, and the interval between initial testing and retesting ranged from one day to three years. Reliability coefficients for most of the aptitudes were in the range of .80 to .90. Table I indicates the aptitude reliability (initial test - retest) coefficients for a study involving 1,705 persons.

TABLE I

Stability Coefficients for Subsamples in the Short-Range Reliability and Practice Effects Study (Based on Initial Test-Retest with Alternate Forms B-1002A and B, Respectively)

	Intervals Between Test and Retest				
Aptitude	1 Day	2 Weeks	6 Weeks	13 Weeks	26 Weeks
G--Intelligence					
Males	.94	.92	.93	.90	.94
Females	.91	.92	.90	.91	.94
V--Verbal Aptitude					
Males	.88	.88	.90	.86	.90
Females	.85	.90	.87	.87	.89
N--Numerical Aptitude					
Males	.94	.92	.95	.93	.94
Females	.92	.94	.90	.91	.92
S--Spatial Aptitude					
Males	.86	.84	.88	.81	.87
Females	.81	.73	.78	.83	.82
P--Form Perception					
Males	.86	.84	.84	.83	.81
Females	.84	.86	.80	.77	.84
Q--Clerical Perception					
Males	.84	.83	.87	.86	.76
Females	.85	.77	.84	.80	.82
K--Motor Coordination					
Males	.90	.94	.88	.88	.90
Females	.89	.83	.88	.92	.91
F--Finger Dexterity					
Males	.79	.72	.73	.65	.69
Females	.75	.80	.67	.72	.71
M--Manual Dexterity					
Males	.81	.73	.84	.79	.75
Females	.88	.84	.72	.80	.70

Taylor's Manifest Anxiety Scale was developed to measure the anxiety level of the examinees (See Appendix II). This instrument was administered after the General Aptitude Test Battery. The examinees were told this was an untimed biographical inventory under development and was totally unrelated to their chances of obtaining employment. All of the examinees in the study appeared to have made an effort to accurately complete the inventory.

The Taylor Manifest Anxiety Scale was developed by Janet Taylor from approximately 200 items from the Minnesota Multiphasic Personality Inventory. Five clinicians who served as judges rated these items according to their ability to measure manifest anxiety. Later research reduced the scale to 50 items. (Taylor, 1953).

A group of 1971 students at Iowa State University served as the initial normative group. The mean was 14.56 with the distribution showing a positive skew.

The reliability of the scale appears satisfactory ranging from .81 to .96 (Taylor, 1951, Taylor, 1953). Validity of the scale was based on the relationship between the test to clinical judgments (Taylor, 1953). A correlation of .72 was obtained between Taylor's Manifest Anxiety Scale and the Winne scale. Since the Winne scale measures neuroticism it is assumed that neurotic persons would exhibit high manifest anxiety (Kendall, 1954).

The criterion consisted of the sum of the six paper and pencil aptitude subtests of the GATB. These subtests are General Learning Ability, Verbal Aptitude, Nemerical Aptitude, Spatial Aptitude, Form Perception and Clerical Perception. For the general working popula-

tion of the United States the mean score for each of these six tests is 100 with a standard deviation of 20 (Dvorak, 1970)

Examinees consisted of eighty-three persons that applied for employment in various apprenticeship positions. As expected, a high percentage (95%) of the applicants scheduled for testing took the test. Four examinees did not keep their testing appointment. The examinees were not informed that a research study was being conducted. The sample was essentially white males in their twenties. Two or three females and three or four minorities (Black) were observed. All examinees had completed high school and approximately one quarter of the examinees had some post high school education. None of the examinees had a college degree. One examinee was dropped from this research due to his inability to complete the practice exercises. The practice exercises must be completed for the test to be considered valid.

The following statistical hypotheses were developed for testing

Statistical Hypothesis 1: Test scores will not be significantly different under the praise versus control conditions.

Statistical Hypothesis 2: Test scores will not be significantly different under the praise and time treatment versus just the praise treatment.

Statistical Hypothesis 3: Test scores will not be significantly different under the time versus control treatment conditions.

Statistical Hypothesis 4: Test scores will not be significantly different under the time and praise treatment conditions versus just the time treatment.

Statistical Hypothesis 5: Test scores will not be significantly different for the various levels of measured anxiety among the subject.

The sum of the aptitude scores per sample member constituted the criterion variable, and the independent variables were anxiety score, the praise treatment, and the time treatment. The variables and their symbols are listed below.

Variables:

1. Y_1 = summed aptitude scores
2. X_1 = praise treatment
3. X_2 = traditional non-praise treatment
4. X_3 = time treatment
5. X_4 = traditional non-time treatment
6. X_5 = anxiety score
7. $X_6 = X_1 \times X_3$
8. $X_7 = X_1 \times X_4$
9. $X_8 = X_2 \times X_3$
10. $X_9 = X_2 \times X_4$

The research hypotheses were tested using multiple regression. The computer program described by McNeil, Kelly, and McNeil (1975) was used. Since this procedure calls for models to be constructed so that F ratios can be calculated the following models were constructed:

Models:

1. $\hat{Y}_1 = a_o u + a_1 x_1 + a_2 x_2 + a_3 x_3 + a_4 x_4 + a_5 x_5 + a_6 x_6 + a_7 x_7 + a_8 x_8 + a_9 x_9 + E$

2. $\hat{Y}_1 = a_o u + a_1 x_1 + a_2 x_2 + a_3 x_3 + a_4 x_4 + a_5 x_5 + E$

3. $\hat{Y}_1 = a_o u + a_1 x_1 + a_2 x_2 + a_3 x_3 + a_4 x_4 + E$

4. $\hat{Y}_1 = a_o u + a_1 x_1 + a_2 x_2 + aE$

5. $\hat{Y}_1 = a_o u + a_3 x_3 + a_4 x_4 + E$

6. $\hat{Y}_1 = a_o u + a_5 x_5 + E$

7. $\hat{Y}_1 = a_o u + E$

The first statistical procedure involved testing for the significance of the interaction. A significant interaction would preclude further meaningful statistical analysis. The McNeil, Kelly, McNeil computer program calls for testing a restricted model against a full model, To test for the effects of interaction the following models are appropriate:

Model 1 = Full Model
Model 2 = Restricted Model

An F ratio was calculated according to the following formula:

$$F = \frac{(R\ Squared\ Full - R\ Squared\ Restricted)/Degrees\ Freedom\ 1}{(1.0 - R\ Squared\ Full)/Degrees\ Freedom\ 2}$$

Throughout an alpha level of .05 was used as the point at and below which the results were accepted as statistically significant.

The second statistical procedure tests Research Hypothesis 1.

Model 4 = Full Model
Model 7 = Restricted Model

This is a main effects question; i.e. does the praise treatment work?

Statistical procedure three tests Research Hypothesis 2.

Model 3 = Full Model
Model 5 = Restricted Model

This is a covariance question; i.e. does praise treatment work over and above the effects of the time treatment?

Statistical procedure four tests Research Hypothesis 3.

Model 5 = Full Model
Model 7 = Restricted Model

This is a main effects question; i.e. does the time treatment work?

Statistical procedure five tests Research Hypothesis 4.

Model 3 = Full Model
Model 4 = Restricted Model

This is a covariance question; i.e. does time treatment work over and above the effects of the praise treatment?

Statistical procedure six tests Research Hypothesis 5.

Model 6 = Full Model
Model 7 = Restricted Model

This is a main effects question; does knowledge of anxiety increase ability to predict aptitude test scores?

Results

This section will present the results of the statistical tests and other statistical data relevant to this research project.

Data was run at the Wayne State University Computing center using the McNeil, Kelly, McNeil computer program for multiple regression. (Appendix III) Table II presents the means and standard deviations for all variables including computer generated variables created to test for possible interaction effects. Table III presents correlations between the sixteen variables. It should be noted that variables one through four are categorical variables. This explains the negative perfect correlation between variables one and two and between variables three and four.

The sample was randomly split into the various control and treatment groups since the control group was administered the GATB in the standardized manner their mean scores on the GATB aptitudes should be the best estimates of the test scores for the various treatment groups. The mean aptitude score (631.8:6) for the control group was 105.3. The mean aptitude score for the time treatment group was 108.7 or 3.4 points higher than the control group. The mean aptitude score for the praise treatment group was 108.2 or 2.9 points higher than the control group. The final treatment group consists of Praise and Time combined which had a mean aptitude score of 116.3 or 11 points higher than the control group. These results are shown in tables IV and V.

Seven models were developed to facilitate the calculation of the F ratios. An alpha level of .05 was used. In each model

variable sixteen, the sum of the six aptitude tests, was the criterion. The following pages list the variables in each model the weights assigned to each variable, and the R squared value (amount of variance accounted for by that model) for the model:

Model 1 R Squared = .12

Variable Number	Weight
1	0.67
2	0.00
3	-4.11
4	0.00
5	1.51
12	49.64
13	0.00
14	0.00
15	-20.18
Constant	635.77

Model 2 R Squared = .11

Variable Number	Weight
1	34.34
2	0.00
3	27.54
4	0.00
5	1.44
Constant	611.24

Model 3 R Squared = .10

Variable Number	Weight
1	37.64
2	0.00
3	28.28
4	0.00
Constant	626.76

Model 4 R Squared = .06

Variable Number	Weight
1	34.15
2	0.00
Constant	639.51

Model 5 R Squared = .04

Variable Number	Weight
3	28.85
4	0.00
Constant	639.47

Model 6 R Squared = .10

Variable Number	Weight
5	1.38
Constant	638.67

Model 7 consisted of the criterion mean and was used as the restricted model in some of the statistical tests.

STATISTICAL TESTS

Before the statistical hypotheses could be tested, it was appropriate to first test for the effects of interaction. A significant interaction effect would have made further interpretation of the data inappropriate. The test for interaction effects consisted of using Model 1 as the full Model and Model 2 as the Restricted Model. This test resulted in an F ratio of 0.23 which has a directional probability of 0.46.

Hypothesis 1 was tested using Model 4 as the full model and Model 7 as the restricted model. This test resulted in an F ratio of 4.92 which has a directional probability of 0.01.

Hypothesis 2 was tested using Model 3 as the full model and Model 5 as the restricted model. This test resulted in an F ratio of 4.94 which has a directional probability of 0.01.

Hypothesis 3 was tested using Model 5 as the full model and Model 7 as the restricted model. This test resulted in an F ratio of 3.63 which has a directional probability of 0.03.

Hypothesis 4 was tested using Model 3 as the full model and Model 4 as the restricted model. This test resulted in an F ratio of 3.65 which has a directional probability of 0.03.

Hypothesis 5 was tested using Model 6 as the full model and Model 7 as the restricted model. This test resulted in an F ratio of 0.75 which is not statistically significant.

TABLE II

Variable	Mean	Standard Division
1. Time Treatment	0.3855	0.4867
2. Traditional Non-Time Treatment	0.6145	0.4367
3. Priase Treatment	0.4578	0.4982
4. Traditional Non-Praise Treatment	0.5422	0.4982
5. Anxiety Score	10.8554	4.8150
6. General Learning Aptitude	106.7711	14.4042
7. Verbal Aptitude	100.1687	12.8221
8. Numerical Aptitude	102.4217	14.6148
9. Spatial Aptitude	116.1928	20.4530
10. Form Perception	115.2650	17.2307
11. Clerical Perception	111.8554	14.3160
12. Time x Praise (1 x 3)	0.1807	0.3848
13. Time x Non-Priase (1 x 4)	0.2048	0.4036
14. Non-Time x Praise (2 x 3)	0.2771	0.4476
15. Non-Time x Non-Praise (2 x 4)	0.3373	0.4728
16. Sum of Aptitude Scores (variables 6-11)	652.6746	69.4285

TABLE III

INTER-CORRELATIONS

VARIABLES

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1.	1.00															
2.	-1.00	1.00														
3.	.02	-.02	1.00													
4.	-.02	.02	-1.00	1.00												
5.	-.05	.05	.53	.53	1.00											
6.	.22	-.22	.16	-.16	.19	1.00										
7.	.16	-.16	.07	-.07	.22	.76	1.00									
8.	.15	-.15	.12	-.12	.09	.74	.48	1.00								
9.	.26	-.26	.20	-.20	.03	.73	.40	.28	1.00							
10.	.09	-.09	.11	-.11	-.06	.47	.36	.33	.46	1.00						
11.	.18	-.18	.25	-.25	.02	.37	.35	.44	.18	.57	1.00					
12.	.59	-.59	.51	-.51	-.03	.29	.22	.12	.41	.10	.16	1.00				
13.	.64	-.64	-.47	.47	-.03	-.01	.02	.06	.09	.01	.06	-.24	1.00			
14.	-.49	.49	.67	-.67	.09	-.07	-.12	.02	-.13	.03	.14	-.29	-.31	1.00		
15.	-.56	.56	-.66	.66	-.03	-.16	-.05	-.18	-.14	-.12	-.31	-.34	-.36	-.44	1.00	
16.	.24	-.24	.21	-.21	.10	.91	.72	.71	.73	.73	.64	.31	.00	-.03	-.22	1.00

TABLE IV

The General Aptitude Test Battery (GATB) subtest results (population mean of 100 and a standard deviation of 20)

	G	V	N	S	P	O	TOTAL
Control Group							
Total	2899	2780	2767	3143	3144	2956	
$\bar{x}$	103.5	99.3	98.8	112.3	112.3	105.6	631.8
n = 28							$\bar{x}$ = 105.3
Time Treatment							
Total	1810	1693	1771	1917	1966	1930	
$\bar{x}$	106.5	99.6	104.2	112.8	115.6	113.5	652.2
n = 17							$\bar{x}$ = 108.7
Praise Treatment							
Total	2420	2247	2369	2572	2671	2647	
$\bar{x}$	105.2	97.7	103.0	111.8	116.1	115.1	648.9
n = 23							$\bar{x}$ = 108.2
Time & Praise Treatment							
Total	1733	1594	1594	2012	1786	1751	
$\bar{x}$	111.5	106.3	106.3	134.1	119.1	116.7	698.0
n = 15							$\bar{x}$ = 116.3
All Groups							
Total	8862	8314	8501	9644	9567	9284	
$\bar{x}$	106.8	100.2	102.4	116.2	115.3	111.9	652.7
n = 83							$\bar{x}$ = 108.8

TABLE V

CONTROL	TIME AND PRAISE	PRAISE	TIME
1. 694	1. 866	1. 715	1. 640
2. 729	2. 762	2. 6[illegible]	2. 713
3. 597	3. 630	3. 704	3. 718
4. 682	4. 732	4. 749	4. 618
5. 687	5. 631	5. 561	5. 620
6. 732	6. 711	6. 624	6. 570
7. 678	7. 700	7. 614	7. 519
8. 641	8. 726	8. 624	8. 556
9. 624	9. 652	9. 500	9. 528
10. 674	10. 646	10. 728	10. 770
11. 630	11. 684	11. 586	11. 626
12. 613	12. 697	12. 719	12. 626
13. 610	13. 625	13. 597	13. 686
14. 653	14. 721	14. 637	14. 741
15. 643	15. 687	15. 684	15. 715
16. 650		16. 631	16. 691
17. 631		17. 725	17. 767
18. 632	TOTAL: 10,470	18. 658	
19. 714		19. 616	
20. 601		20. 617	TOTAL: 11,104
21. 600	$\bar{x}$ = 698	21. 713	
22. 615		22. 746	
23. 511		23. 522	$\bar{x}$ = 653.2
24. 663			
25. 603		TOTAL: 14,944	
26. 559			
27. 472		$\bar{x}$ = 649.7	
28. 561			
TOTAL: 17,699			
$\bar{x}$ = 632.1			

Conclusion

This research study investigated the effects of praise, awareness of time, and anxiety on aptitude test scores. Previous studies on praise generally concluded that test scores are higher when an examinee is praised. No research could be found in the literature which directly examined whether examinees scored higher when they were aware of how much time remained at various points during a test. The anxiety research literature is in general agreement that high anxiety subjects score lower on tests when the instructions are threatening but when the test instructions are nonthreatening anxiety level has no significant effect on test scores.

The research was conducted in a real life setting. Eighty-four (84) persons who applied for various apprenticeship job openings were the subjects. These persons took an aptitude test, the General Aptitude Test Battery (GATB), as one of the screening devices to gain entry into the apprenticeship programs. Sample members and the treatment conditions were randomly assigned to five groups taking the GATB. An anxiety questionnaire was given after the GATB to all groups. Two groups served as a Control receiving no Praise or Time treatment. One group received just the Time treatment, another group received just the Praise treatment, and one group received both the Time and Praise treatments.

An inspection of the mean scores on the variables indicates this was a rather typical group of subjects. The anxiety mean scores (10.9) was slightly below average for the Taylor Manifest Anxiety Scale while the mean aptitude score (108.7) on the GATB was slightly

above average for a sample of high school graduates.

As expected, Model 1 which included all treatments and interactions had the highest R squared value. However, Model 1 was not significantly better than Model 2 which included all treatments but not the interaction. Therefore, the effects of interaction did not add significantly to the ability to predict the sample member's test scores. A significant interaction would have precluded further interpretation of the data.

Research Hypothesis 1 asked the question, "Does the praise treatment work?" The probability of .01 was found to be highly significant, the statistical hypothesis is thus rejected. An investigation of the weights in Model 4 shows the praise treatment having a positive weight (32) while the traditional non-praise treatment has a weight of zero (0.0). This weighing is in the direction hypothesized. In this sample at least, persons who were moderately praised for their efforts on the test scored significantly higher than persons who were not praised.

Research Hypothesis 2 asked a covariance type question; i.e., "Does praise treatment work over and above the effects of the time treatment? The statistical hypothesis is rejected at .01 level of significance. The weights in the Full Model (Model 3) support the directionality of the research hypothesis.

Research Hypothesis 3 asked the question, "Does the time treatment work? The F-ratio was significant at the .03 level. The statistical hypothesis is rejected. The weights in the Full Model (Model 5) are in the direction hypothesized. Sample members who were made

aware of the time remaining in the test scored significantly higher than persons who were not given this information.

Research Hypothesis 4 asked the question, "Does the time treatment work over and above the effects of the praise treatment?" The calculated probability of .03 was significant, statistical hypothesis was rejected. The weights in the Full Model (Model 3) are in the direction hypothesized.

Research Hypothesis 5 asked the question, "Does knowledge of the anxiety score increase the ability to predict the criterion?" Since the calculated probability is greater than .05, thus failing to reject the statistical hypothesis. Knowledge of the anxiety score does not increase the ability to predict performance on the aptitute battery.

In summary, the research sample appears to be a fairly typical sample of United States males; however, this sample was not drawn randomly so caution should be exercised in making generalizations. Evidence seemed to support the hypotheses that praise and making an examinee aware of the time remaining in a test increase test scores. These two treatments together explained .10 of the variance. This R squared value is fairly high when one considers that most of the variance could be explained by pretest aptitude scores, educational level, and environmental and genetic factors. Subjects' anxiety level did not have a significant effect on their test scores. Based on previous findings in the literature this suggests that the examinees did not perceive the test situation as threatening.

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DEFINITIONS OF APTITUDES MEASURED BY GENERAL APTITUDE TEST BATTERY

The nine aptitudes measured by GATB B-1002 are defined below. The letter preceding each definition is a symbol to identify that aptitude. The part or parts of the GATB measuring each aptitude follows each definition.

G - General Learning Ability. -- The ability to "catch on" or understand instructions and underlying principles; the ability to reason and make judgments. Closely related to doing well in school. Measured by Parts 3, 4, and 6.

V - Verbal Aptitude. -- The ability to understand meaning of words and to use them effectively. The ability to comprehend language, to understand relationships between words and to understand meanings of whole sentences and paragraphs. Measured by Part 4.

N - Numerical Aptitude. -- Ability to perform arithmetic operations quickly and accurately. Measured by Parts 2 and 6.

S - Spatial Aptitude.-- Ability to think visually of geometric forms and to comprehend the two-dimensional representation of three-dimensional objects. The ability to recognize the relationships resulting from the movement of objects in space. Measured by Part 3.

P - Form Perception. -- Ability to perceive pertinent detail in objects or in pictorial or graphic material. Ability to make visual comparisons and discriminations and see slight differences in shapes and shadings of figures and widths and lengths of lines. Measured by Parts 5 and 7.

Q - Clerical Perception. -- Ability to perceive pertinent detail in verbal or tabular material. Ability to observe differences in copy, to proofread words and numbers, and to avoid perceptual errors in arithmetic computation. Measured by Part 1.

K - Motor Coordination. -- Ability to coordinate eyes and hands or fingers rapidly and accurately in making precise movements with speed. Ability to make a movement response accurately and swiftly. Measured by Part 8.

F - Finger Dexterity. -- Ability to move the fingers, and manipulate small objects with the fingers, rapidly or accurately. Measured by Parts 11 and 12.

M - Manual Dexterity. -- Ability to move the hands easily and skillfully. Ability to work with the hands in placing and turning motions. Measured by Parts 9 and 10.

COMPOSITION OF THE GATB B-1002

Tests in B-1002.--The separate answer sheet form of the GATB, B-1002, is composed of twelve tests selected because they are good measures of nine aptitudes that have been found to be important for successful performance in a wide variety of occupations. Eight of the twelve are paper-and-pencil tests and four are apparatus tests. Each of the tests has been designated by number, as Part 1, Part 2 and so on up to Part 12. The paper-and-pencil tests appear in three booklets: Book I includes Part 1 through 4; Book II Parts 5 through 7; and Part 8, which is not machine scorable, appears in a separate booklet. Two of the apparatus tests, Parts 9 and 10, involve the use of the USES Pegboard; the other two apparatus tests, Parts 11 and 12, involve the use of the USES Finger Dexterity Board. Approximately 2½ hours are required to administer the GATB.

Alternate Form. -- An alternate form is available for each of the separate answer Sheet tests in B-1002, Parts 1 through 7. The two forms of these tests have been designated as Form A and Form B, respectively; and different answer sheets, scoring, scoring stencils and aptitude score conversion tables have been developed for each form.

Format of the Paper-and-Pencil Tests.-- In the main, the format of each of the tests is similar. Following the title of the test, a brief statement explains what is to be done by the examinee. A few sample exercises illustrate clearly what the examinee is to do and the procedure for working each exercise. The examinee is then given an opportunity to try a few practice exercises. After the practice exercises have been attempted, the examiner determines whether or not the examinee understands the instructions and assists him in the event of difficulty. This procedure is basic because each test is given to measure a particular aptitude, not to determine if the examinee can follow instructions. A statement of the time limit for each test and other appropriate instructions follow the practice exercises. Then examinees work on the test proper. The tests contain more items than can ordinarily be completed in the time allowed.

Descriptions of Tests.--The description of each of the tests in B-1002 is given below. The aptitude or aptitudes measured by each test are listed after each description.

Part 1 - Name Comparison.-- Consists of two columns of names. The examinee inspects each pair of names, one in each column, and indicates whether the names are the same or different. Measures Clerical Perception.

Part 2 - Computation.-- Consists of a number of arithmetic exercises requiring the addition, subtraction, multiplication, or division of whole numbers. Measures Numerical Aptitude.

Part 3 - Three-Dimensional Space. -- Consists of a series of exercises containing a stimulus figure and four drawings of three-dimensional objects. The stimulus figure is pictured as a flat piece of metal which is to be either bent, or rolled, or both. Lines indicated where the stimulus figure is to be bent. The examinee indicates which one of the four drawings of three-dimensional objects can be made from the stimulus figure. Measures Intelligence and Spatial Aptitude.

Part 4 - Vocabulary.--Consists of sets of four words. The examinee indicates which two words have either the same or opposite meanings. Measures Intelligence and Verbal Aptitude.

Part 5 - Tool Matching. -- Consists of a series of exercises containing a stimulus drawing and four black-and-white drawings of simple shop tools. The examinee indicates which of the four black-and-white drawings is the same as the stimulus drawing. Variations exist only in the distribution of black and white in each drawing. Measures Form Perception.

Part 6 - Arithmetic Reason.--Consists of a number of arithmetic problems expressed verbally. Measures Intelligence and Numerical Aptitude.

Part 7 - Form Matching.- Consists of two groups of variously shaped line drawings. The examinee indicates which figure in the second group is exactly the same size and shape as each figure in the first or stimulus group. Measures Form Perception.

Part 8 - Mark Making. --Consists of a series of squares in which the examinee is to make three pencil marks, working as rapidly as possible. The marks to be made are short lines, two vertical and the third horizontal line beneath them. Measures Motor Coordination.

Part 9 - Place. -- The equipment used for this test and for Part 10 consists of a rectangular wooden board (Pegboard) divided into two sections, each section containing 48 holes. The upper section contains 48 cylindrical wooden pegs. The examinee removes the wooden pegs from holes in the upper part of the board and inserts them in the corresponding holes in the lower part of the board, moving two pegs simultaneously, one in each hand. This performance is done three times, with the examinee working rapidly to move as many of the pegs, as possible during the time allowed for each of the three trials. Measures Manual Dexterity.

Part 10 Turn.--The equipment described under Part 9 is also used for this test. For Part 10 the lower section of the board contains the 48 cylindrical pegs. The examinee removes a wooden peg from a hole, turns the peg over so that the opposite end is up, and returns the peg to the hole from which it was taken, using only his preferred hand. The examinee works rapidly to turn and replace as many of the 48 cylindrical pegs as possible during the time allowed. Three trials are given for this performance. Measures Manual Dexterity.

Part 11- Assemble.--The equipment used for this test and for Part 12 consists of a small rectangular board (Finger Dexterity Board) containing 50 holes, and a supply of small metal rivets and washers. The examinee takes a small metal rivet from a hole in the upper part of the board with his preferred hand at the same time removes a small metal washer from a vertical rod with the other hand; examinee puts the washer on the rivet, and inserts the assembled piece into the corresponding hole in the lower part of the board using only his preferred hand. The examinee works rapidly to move and replace as many rivets and washers as possible during the time allowed. Measures Finger Dexterity.

Part 12- Disassemble.--The equipment used for this test is the same as that described for Part 11. Examinee removes the small metal rivet of the assembly from a hole in the lower part of the board; slides the washer to the bottom of the board; puts the washer on the rod with one hand the rivet into the corresponding hole in the upper part of the board with the other (preferred) hand. The examinee works rapidly to move and replace as many rivets and washers as possible during the time allowed. Measures Finger Dexterity.

Biographical Inventory

Instruction: Below are 50 questions that are being evaluated for a biographical inventory under development. Circle either TRUE or FALSE to indicate whether the question is True for you or is False for you. Your answers will be kept secret. Be sure to answer every question.

Print your name here _____ _____
First Last

1. I do not tire quickly. True False
2. I am often sick to my stomach. True False
3. I am about as nervous as other people. True False
4. I have very few headaches. True False
5. I work under a great deal of strain. True False
6. I cannot keep my mind on one thing. True False
7. I worry over money and business. True False
8. I frequently notice my hand shakes when I try to do something. True False
9. I blush as often as others. True False
10. I have diarrhea ("the runs") once a month or more. True False
11. I worry quite a bit over possible troubles. True False
12. I practically never blush. True False
13. I am often afraid that I am going to blush. True False
14. I have nightmares every few nights. True False
15. My hands and feet are usually warm enough. True False
16. I sweat very easily even on cool days. True False
17. When embarrassed I often break out in a sweat which is very annoying. True False
18. I do not often notice my heart pounding and I am seldom short of breath. True False
19. I feel hungry almost all the time. True False
20. Often my bowels don't move for several days at a time. True False
21. I have a great deal of stomach trouble. True False
22. At times I lose sleep over worry. True False
23. My sleep is restless and disturbed. True False
24. I often dream about things I don't like to tell other people. True False
25. I am easily embarrassed. True False
26. My feelings are hurt easier than most people. True False
27. I wish I could be as happy as others. True False
28. I often find myself worrying about something. True False
29. I am usually calm and not easily upset. True False
30. I cry easily. True False
31. I feel anxious about something or someone almost all of the time. True False
32. I am happy most of the time. True False
33. It makes me nervous to have to wait. True False
34. At times I am so restless that I cannot sit in a chair for very long. True False
35. Sometimes I become so excited that I find it hard to get to sleep. True False
36. I have often felt that I faced so many difficulties I could not overcome them. True False
37. At times I have been worried beyond reason about something that really did not matter. True False
38. I do not have as many fears as my friends. True False
39. I have been afraid of things or people that I know could not hurt me. True False
40. I find it hard to keep my mind on a task or job. True False
41. I certainly feel useless at times. True False
42. I am more self-conscious than most people. True False
43. I am the kind of person that takes things hard. True False
44. I am a very nervous person. True False

45. Life is often a strain for me. True False
46. At times I think I am no good at all. True False
47. I am not at all confident of myself. True False
48. At times I feel that I am going to crack up. True False
49. I don't like to face a difficulty or make an important decision. True False
50. I am very confident of myself. True False

NUMBER OF OBSERVATIONS	83
NUMBER OF VARIABLES INPUT	11
NUMBER OF VARIABLES TRANSFORMED	16
NUMBER OF FORMAT CARDS	1
INPUT UNIT NUMBER	5
FORMAT	(4F1.0,F2.0,6F3.0)

MEANS

	Time ON	Time OFF	Praise ON	Praise OFF	Anxiety	General Learning Ability	Verbal Aptitude	Numerical Aptitude	Spatial Aptitude	Form Perception
	1	2	3	4	5	6	7	8	9	10
1	0.3855	0.6145	0.4578	0.5422	10.8554	106.7711	100.1687	102.4217	116.1928	115.2650

	Clerical Perception					Sum of Variables 6-11
	11	12	13	14	15	16
1	111.8554	0.1807	0.2048	0.2771	0.3373	652.6746

STANDARD DEVIATIONS

	1	2	3	4	5	6	7	8	9	10
1	0.4867	0.4867	0.4982	0.4982	4.8150	14.4042	12.8221	14.6148	20.4530	17.2307

	11	12	13	14	15	16
1	14.3160	0.3848	0.4036	0.4476	0.4728	69.4285

CORRELATIONS

	1	2	3	4	5	6	7	8	9	10
1	1.0000	-1.0000	0.0174	-0.0174	-0.0533	0.2171	0.1575	0.1482	0.2552	0.0913
2	-1.0000	1.0000	-0.0174	0.0174	0.0533	-0.2171	-0.1575	-0.1482	-0.2552	-0.0913
3	0.0174	-0.0174	1.0000	-1.0000	0.0527	0.1607	0.0652	0.1174	0.1994	0.1080
4	-0.0174	0.0174	-1.0000	1.0000	-0.0527	-0.1607	-0.0652	-0.1174	-0.1994	-0.1080
5	-0.0533	0.0533	0.0527	-0.0527	1.0000	0.1890	0.2151	0.0923	0.0289	-0.0621
6	0.2171	-0.2171	0.1607	-0.1607	0.1890	1.0000	0.7573	0.7355	0.7295	0.4730
7	0.1575	-0.1575	0.0652	-0.0652	0.2151	0.7573	1.0000	0.4836	0.4037	0.3612
8	0.1482	-0.1482	0.1174	-0.1174	0.0923	0.7355	0.4836	1.0000	0.2832	0.3284
9	0.2552	-0.2552	0.1994	-0.1994	0.0289	0.7295	0.4037	0.2832	1.0000	0.4556
10	0.0913	-0.0913	0.1080	-0.1080	-0.0621	0.4730	0.3612	0.3284	0.4556	1.0000
11	0.1757	-0.1757	0.2492	-0.2492	0.0214	0.3700	0.3455	0.4440	0.1793	0.5743
12	0.5929	-0.5929	0.5111	-0.5111	-0.0314	0.2857	0.2234	0.1236	0.4120	0.1036
13	0.6407	-0.6407	-0.4664	0.4664	-0.0344	-0.0106	-0.0230	0.0609	-0.0851	0.0113

14	-0.4904	0.4904	0.6738	-0.6738	0.0857	-0.0668	-0.1194	0.0245	-0.1322	0.0311
15	-0.5652	0.5652	-0.6557	0.6557	-0.0262	-0.1603	-0.0491	-0.1758	-0.1375	-0.1234
16	0.2394	-0.2394	0.2070	-0.2070	0.0959	0.9107	0.7234	0.7089	0.7302	0.7348

	11	12	13	14	15	16
1	0.1757	0.5929	0.6407	-0.4904	-0.5652	0.2394
2	-0.1757	-0.5929	-0.6407	0.4904	0.5652	-0.2394
3	0.2492	0.5111	-0.4664	0.6738	-0.6557	0.2070
4	-0.2492	-0.5111	0.4664	-0.6738	0.6557	-0.2070
5	0.0214	-0.0314	-0.0344	0.0857	-0.0262	0.0959
6	0.2700	0.2857	-0.0106	-0.0668	-0.1603	0.9107
7	0.3455	0.2234	-0.0230	-0.1194	-0.0491	0.7234
8	0.4440	0.1236	0.0609	0.0245	-0.1758	0.7089
9	0.1793	0.4120	-0.0851	-0.1322	-0.1375	0.7302
10	0.5743	0.1036	0.0113	0.0311	-0.1234	0.7348
11	1.0000	0.1700	0.0593	0.1398	-0.3132	0.6356
12	0.1600	1.0000	-0.2384	-0.2908	-0.3351	0.3066
13	0.0593	-0.2384	1.0000	-0.3142	-0.3621	-0.0036
14	0.1398	-0.2908	-0.3142	1.0000	-0.4418	-0.0332
15	-0.3132	-0.3351	-0.3621	-0.4418	1.0000	-0.2150
16	0.6356	0.3066	-0.0036	-0.0332	-0.2150	1.0000

....MODEL 1 0.00001000
CRITERION 16
PREDICTORS 1 - 5
12 - 15

RSQ = 0.11895441 6 ITERATIONS

VAR. NUMBER	STD. WT.	ERROR
1	0.00467036	0.00000006
2	0.0	-0.00000006
3	-0.02948941	-0.00019473
4	0.0	0.00019473
5	0.10455644	0.00183356
12	0.27511191	-0.00103724
13	0.0	0.00098896
14	0.0	0.00067514
15	-0.13744521	-0.00063902

VAR. NUMBER	WEIGHT
1	0.66620171
2	0.0
3	-4.10944843
4	0.0
5	1.50762939
12	49.63922119
13	0.0
14	0.0
15	-20.18295288
CONSTANT=	635.77095586

****

....MODAL 2 0.00001000
CRITERION 16
PREDICTORS 1 - 5

RSQ = 0.10808569 4 ITERATIONS

VAR. NUMBER	STD. WT.	ERROR
1	0.24073070	-0.00053567
2	0.0	0.00053567
3	0.19759649	-0.00000018
4	0.0	0.00000018
5	0.09959644	0.00129443

VAR. NUMBER	WEIGHT
1	34.33894348
2.	0.0
3	27.53573608
4	0.0
5	1.43611050
CONSTANT=	611.23914880

****

....MODEL 3 0.00001000
CRITERION 16
PREDICTORS 1 - 4

RSQ = 0.09847350 2 ITERATIONS

VAR. NUMBER	STD. WT.	ERROR
1	0.23586226	-0.00000006
2	0.0	0.00000006
3	0.20293021	-0.00000012
4	0.0	0.00000012

VAR. NUMBER	WEIGHT
1	33.64448547
2	0.0
3	28.27900696
4	0.0
CONSTANT=	626.75617618

****

....MODEL 4 0.00001000
CRITERION 16
PREDICTORS 1 - 2

RSQ = 0.05730521 1 ITERATIONS

VAR. NUMBER	STD. WT.	ERROR
1	0.23938507	0.0
2	0.0	0.0

VAR. NUMBER	WEIGHT
1	34.14698792
2	0.0
CONSTANT=	639.50945480

****

....MODEL 5 0.00001000
CRITERION 16
PREDICTORS 3 - 4

RSQ = 0.04285925 1 ITERATIONS

VAR. NUMBER	STD. WT.	ERROR
3	0.20702475	0.0
4	0.0	0.0

VAR. NUMBER	WEIGHT
3	28.84959412
4	0.0
CONSTANT=	639.46630931

****

....MODEL 6 0.00001000
CRITERION 16
PREDICTORS 5 - 5

RSQ = 0.00919260 1 ITERATIONS

VAR. NUMBER	STD. WT.	ERROR
5	0.09587806	0.0

VAR. NUMBER	WEIGHT
5	1.38249397
CONSTANT=	637.66761080

44

RATIO 1 .....

$$F = \frac{(RSQ\ F - RSQ\ R)\ /\ DF1}{(1.0 - RSQ\ F)\ /\ DF2} = \frac{(0.11895 - 0.10809)\ /\ 4}{(1.0 - 0.11895)\ /\ 75} = 0.231303$$

MODEL 1 = FULL MODEL — NONDIRECTIONAL PROBABILITY = 0.9196346

MODEL 2 = RESTRICTED MODEL — DIRECTIONAL PROBABILITY (IN HYPOTHESIZED DIRECTION) = 0.4598173

RATIO 2 .....

$$F = \frac{(RSQ\ F - RSQ\ R)\ /\ DF1}{(1.0 - RSQ\ F)\ /\ DF2} = \frac{(0.10809 - 0.09847)\ /\ 1}{(1.0 - 0.10809)\ /\ 79} = 0.851381$$

MODEL 2 = FULL MODEL — NONDIRECTIONAL PROBABILITY = 0.3590537

MODEL 3 = RESTRICTED MODEL — DIRECTIONAL PROBABILITY (IN HYPOTHESIZED DIRECTION) = 0.1795269

RATIO 3 .....

$$F = \frac{(RSQ\ F - RSQ\ R)\ /\ DF1}{(1.0 - RSQ\ F)\ /\ DF2} = \frac{(0.09847 - 0.05731)\ /\ 1}{(1.0 - 0.09847)\ /\ 80} = 3.653206$$

MODEL 3 = FULL MODEL — NONDIRECTIONAL PROBABILITY = 0.0595015

MODEL 4 = RESTRICTED MODEL — DIRECTIONAL PROBABILITY (IN HYPOTHESIZED DIRECTION) = 0.0297507

RATIO 4 .....

$$F = \frac{(RSQ\ F - RSQ\ R)\ /\ DF1}{(1.0 - RSQ\ F)\ /\ DF2} = \frac{(0.09847 - 0.04286)\ /\ 1}{(1.0 - 0.09847)\ /\ 80} = 4.935118$$

MODEL 3 = FULL MODEL — NONDIRECTIONAL PROBABILITY = 0.0291241

MODEL 5 = RESTRICTED MODEL — DIRECTIONAL PROBABILITY (IN HYPOTHESIZED DIRECTION) = 0.0145620

RATIO 5 .....

```
                    ( RSQ F - RSQ R ) / DF1        (0.05731 -0000000 ) /   1
F =  ------------------------------------- =  ------------------------------ =  4.923886
                    (  1.0  - RSQ F ) / DF2        (  1.0   -0.05731 ) /  81

MODEL   4 = FULL MODEL                      NONDIRECTIONAL  PROBABILITY =     0.0292983

MODEL   7 = RESTRICTED MODEL                DIRECTIONAL     PROBABILITY =     0.0146492
                                            (IN HYPOTHESIZED DIRECTION)
```

****

```
F RATIO 6 .....

                    ( RSQ F - RSQ R ) / DF1        (0.04286 -0000000 ) /   1
F =  ------------------------------------- =  ------------------------------ =  3.627051
                    (  1.0  - RSQ F ) / DF2        (  1.0   -0.04286 ) /  81

MODEL   5 = FULL MODEL                      NONDIRECTIONAL  PROBABILITY =     0.0604214

MODEL   7 = RESTRICTED MODEL                DIRECTIONAL     PROBABILITY =     0.03C2107
                                            (IN HYPOTHESIZED DIRECTION)
```

****

```
....F RATIO 7          0.00001000
  CRITERION     0
 PREDICTORS     6 -   7
                0 -   1
                0 -  81

RSQ IS GREATER THAN ONE, CHECK THIS MODEL CARD
AND AVOID LATER INTERPRETATIONS INVOLVING THIS MODEL
```

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PLOT OF VARIABLE 16 (X AXIS) AGAINST VARIABLE 5 (Y AXIS).